Attorney Docket No. A-76718/DNM
Application No. 10/686,363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: **JOSEPH TAK MING KWOK**	Art Unit: 2871
Application No.: **10/686,363**	Examiner: Nouyen, Thanh Nhan P
Filed: **October 14, 2003**	Docket No.: A-76718/DNM
For: **LIQUID CRYSTAL DISPLAY WITH ENHANCED COLOR**	*Certificate of Mailing (37 C.F.R. § 1.8(a))* *I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop Amendment, Director of the U.S. Patent and Trademark Office, P. O. Box 1450, Alexandria, VA 22313-1450 on* March 24, 2005 *Donald N. MacIntosh*

DECLARATION OF JOSEPH TAK MING KWOK

Mail Stop AMENDMENT
Director of the U.S. Patent and Trademark Office
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action mailed December 29, 2004, applicant hereby submits the declaration of inventor, Joseph Tak Ming Kwok.

I, Joseph Tak Ming Kwok, declare the following to be true:

1. I am the inventor of patent application, Serial No. 10/686,363, and have read both the office action mailed December 29, 2004 and the Flynn patent No. 5,815,228.

2. The Flynn patent shows only the use of a phosphorescent layer to emit light as a backlight. Interestingly, many people are confused that phosphorescent

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materials and fluorescent materials mean the same thing. In fact they are quite different in behavior and characteristics. Phosphorescent materials absorb light energy and store it up for later release over a long period of time. This property makes it undesirable under our application as it weakens the reflected light considerably when using the LCD under ambient light.

3. The Flynn patent provides an LCD with a layer of phosphorescent material beneath it so it can emit light at a predetermined frequency and intensity following stimulation by ambient light. In fact, as is illustrated in the attached Figure 1, the phosphorescent layer absorbs light energy impinging upon it in effect weakening the reflection of light. As shown there, the ratio of light reflectance from the segment to the background is between 0.4 and 0.5 showing a weak contrast. Thus, Flynn's main focus is on using the phosphorescent layer as a method of backlighting. In contrast, in the present invention, very bright colors can be produced on the LCD by using a fluorescent layer. Actual measurements were made or supervised by me as shown in Figures 2 to 6 which show that with selected fluorescent material around the orange and yellow spectrum, that light amplification at that wavelength of up to 5 times can be achieved.

4. The following is a detailed summary of the measurements producing Figures 1 to 6. Figure 1 shows the result obtained with a phosphorescent layer. As it can be seen, the response is level across the visible light spectrum indicating deteriorating spectral response at each wavelength and the ratio of light reflectance from the segment to the background is between 0.4 to 0.5 showing a weak contrast. The loss of intensity on reflection may be explained by the fact that phosphorescent material stores up some of the light energy it receives and is not reflected. Notice also that there is a sudden surge of intensity at the 780- nanometer region and beyond. This might be due to the fact that there is more light energy being transformed into heat than is reflected as light in the other visible wavelength. The light absorption with subsequent transformation into heat explains the surge at the infrared end of the spectrum. The

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behavior of this material is evidently not a desirable outcome if it is intended to enhance visibility of viewing in a Liquid Crystal Display, not to mention the spectral selectivity and amplification of light as will be evident with our present invention by using fluorescent material in the substrate layer.

Figure 2 shows the measurement result with the phosphorescent layer replaced by a layer of Rodamine™ red (a trade name) fluorescent material. The peak spectral response happens in the 700 nanometer wavelength and its intensity is almost 3 times relative to the background while other wavelengths below 630 nanometer are suppressed. (About 6 times better contrast when compared with the previous measurement using a phosphorescent layer)

Figure 3 shows another measurement using an orange red fluorescent layer. Here, there are two peak responses. One is around the 700- nanometer wavelength red region and another around 640- nanometer orange region, showing the possible mixture of two fluorescent materials. Also, the peak intensity is almost 5 times compared to the spectral response of the background.

Figure 4 shows another measurement using a yellow fluorescent layer. It shows that the peak response is around the 600 nanometer yellow visible region of the light spectrum and another peak with less intensity around the 550 nanometer green region, possibly a result of a combination of two types of fluorescent material. The peak intensity is about 2 times background reflectance and the second peak is 1.4 times.

Figure 5 shows another measurement using a green fluorescent layer. It shows two peak responses indicating possibly two component nature of that particular fluorescent material. The peak responses are in the 530 nanometer green region and another at around the 600 yellow region. Light intensity is this case is only 1.2 times over the background.

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Figure 6 shows another measurement using a blue fluorescent layer. It shows a hump peak response between the 400 to 550 nanometer blue region with intensity of 1.4 times over the background.

A sample is also measured using a layer of black paint in place of the fluorescent layer. The measurement (Figure 7) indicates nearly total absorption with average intensity of around 0.15 times that of the background showing good contrast ratio of black and white (actually the background is grayish). This is the usual case with LCD display where visible segments are seen as black against a silvery grayish background. The contrast ratio of black segments to background is about 1/0.15 = 6.7 times.

5. In conclusion, it is evident that the phosphorescent material of Flynn cannot achieve our purpose of light selectivity and amplification at a selected wavelength.

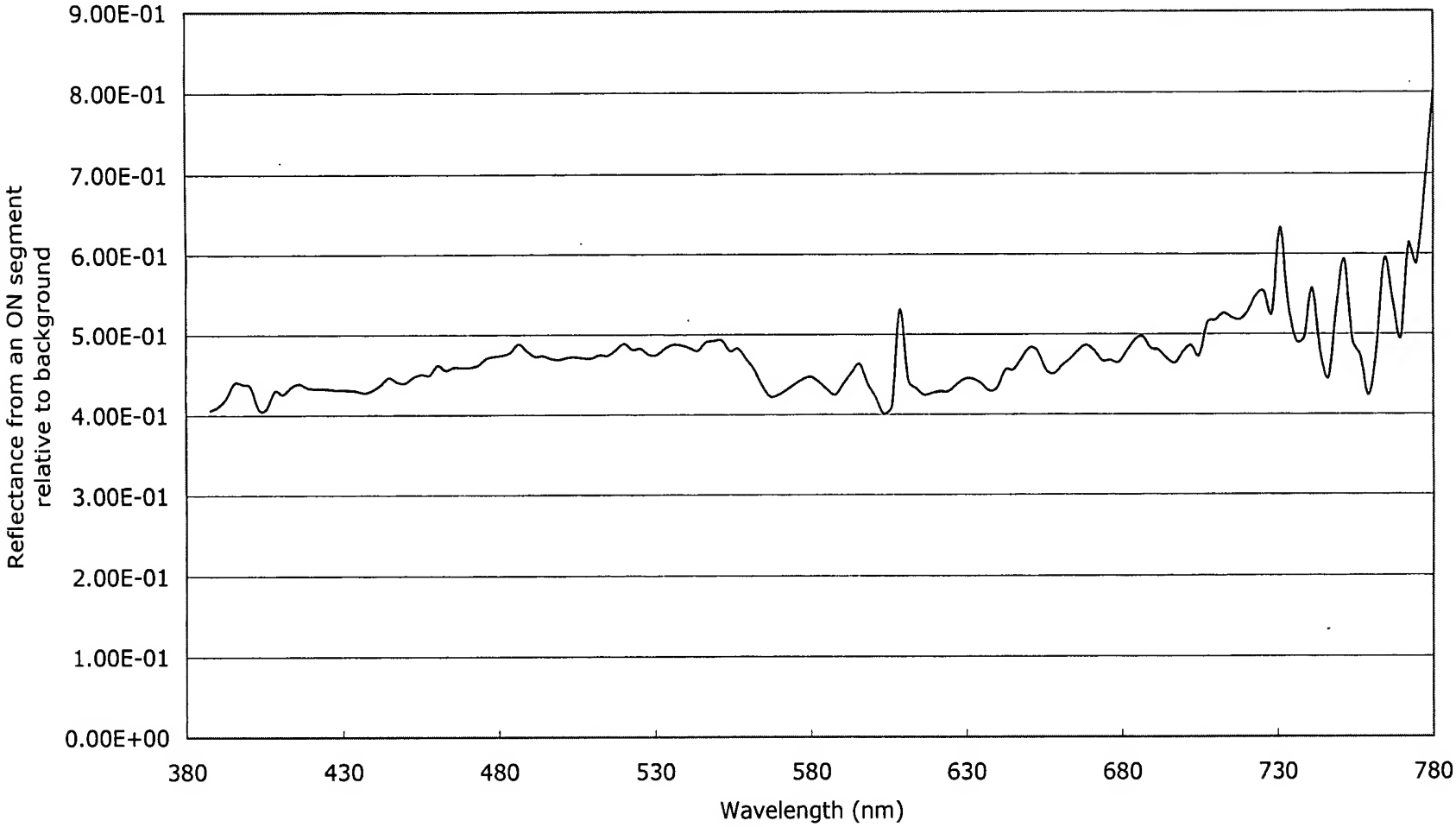
6. The foregoing Figures 1-7 are attached to this declaration.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, United States Code, §1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

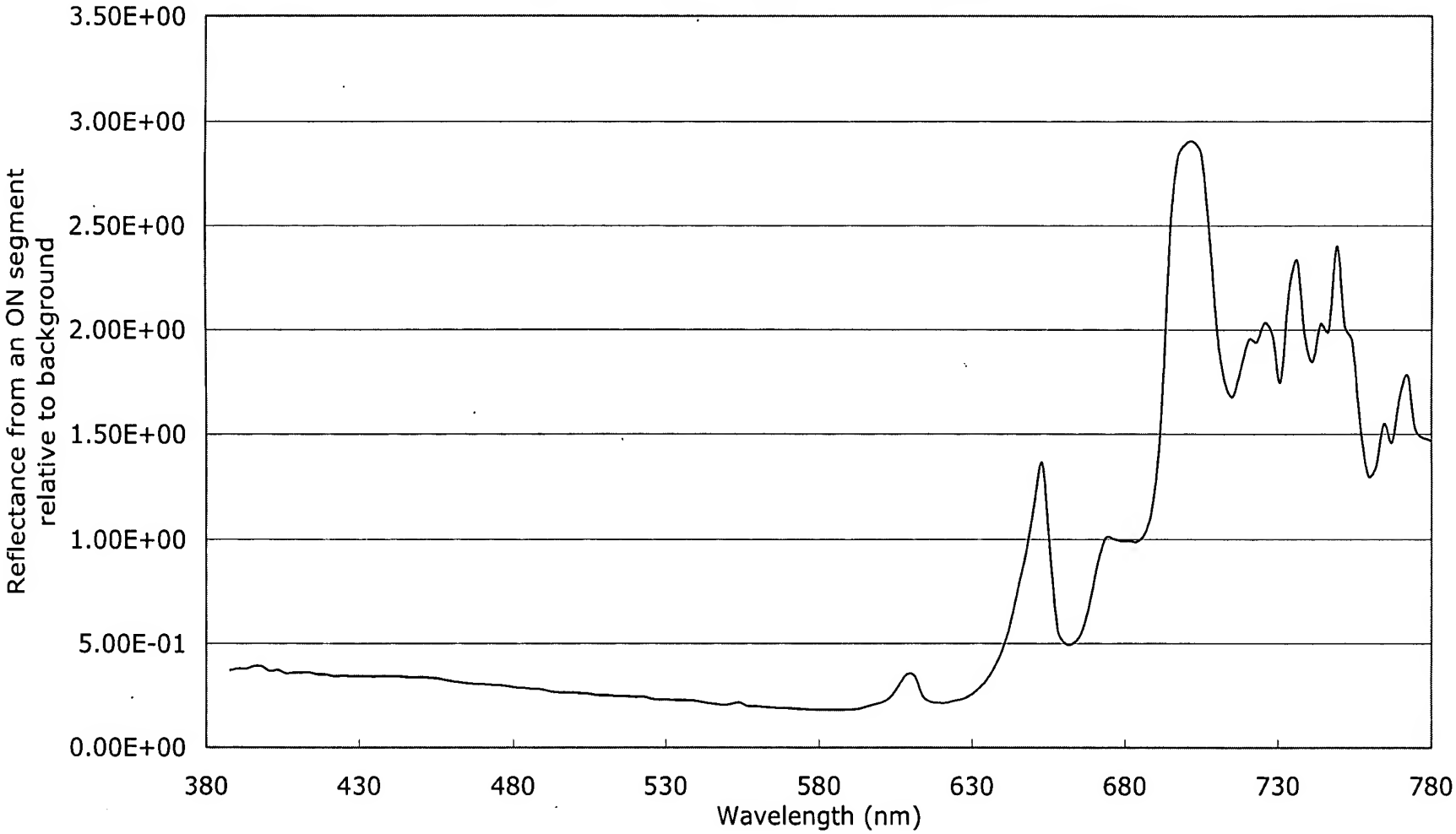
Dated: 19-3-2005.

JOSEPH TAK MING KWOK

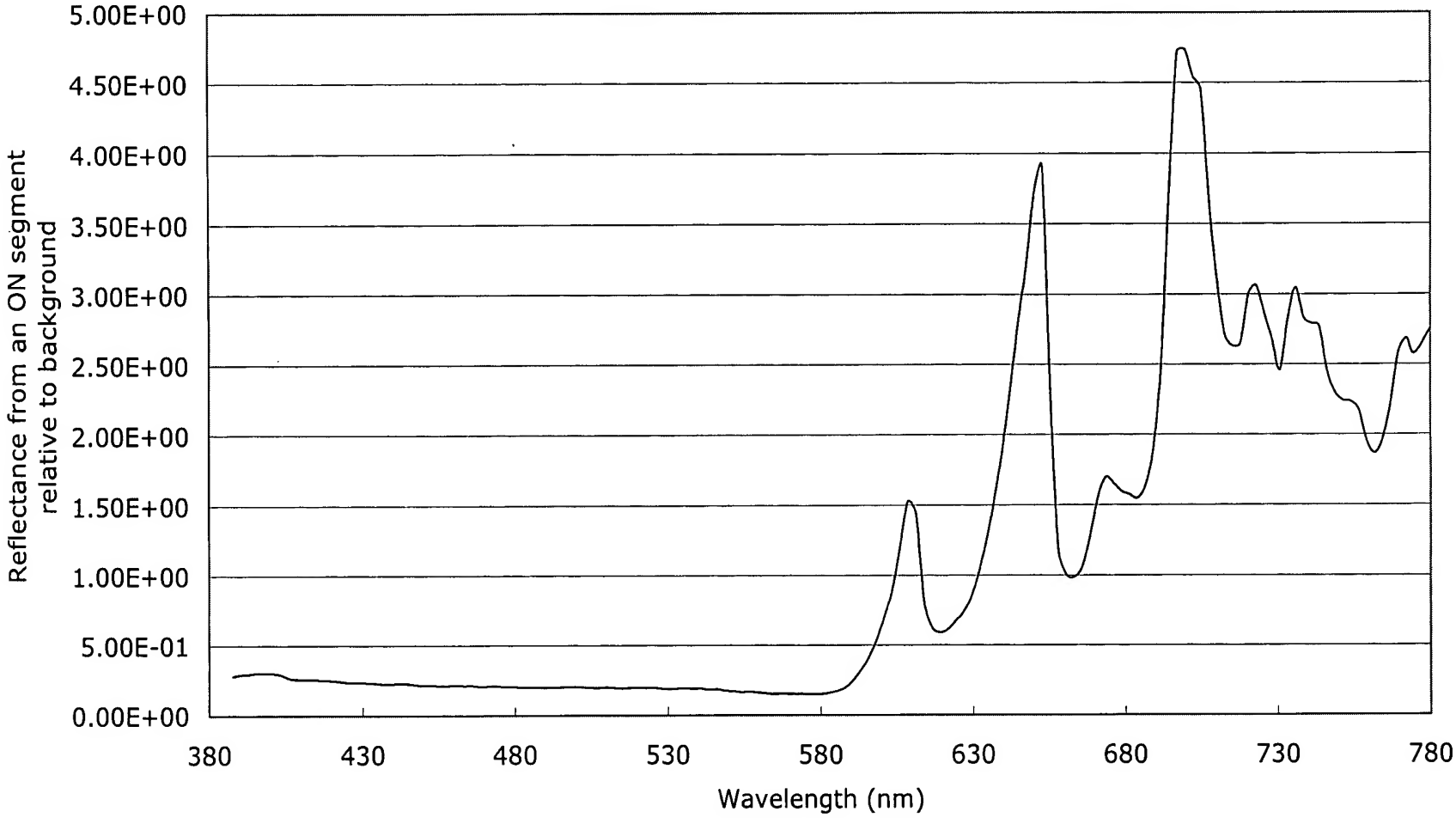
(Figure 1) Data from the unit with a Phosphorescent layer



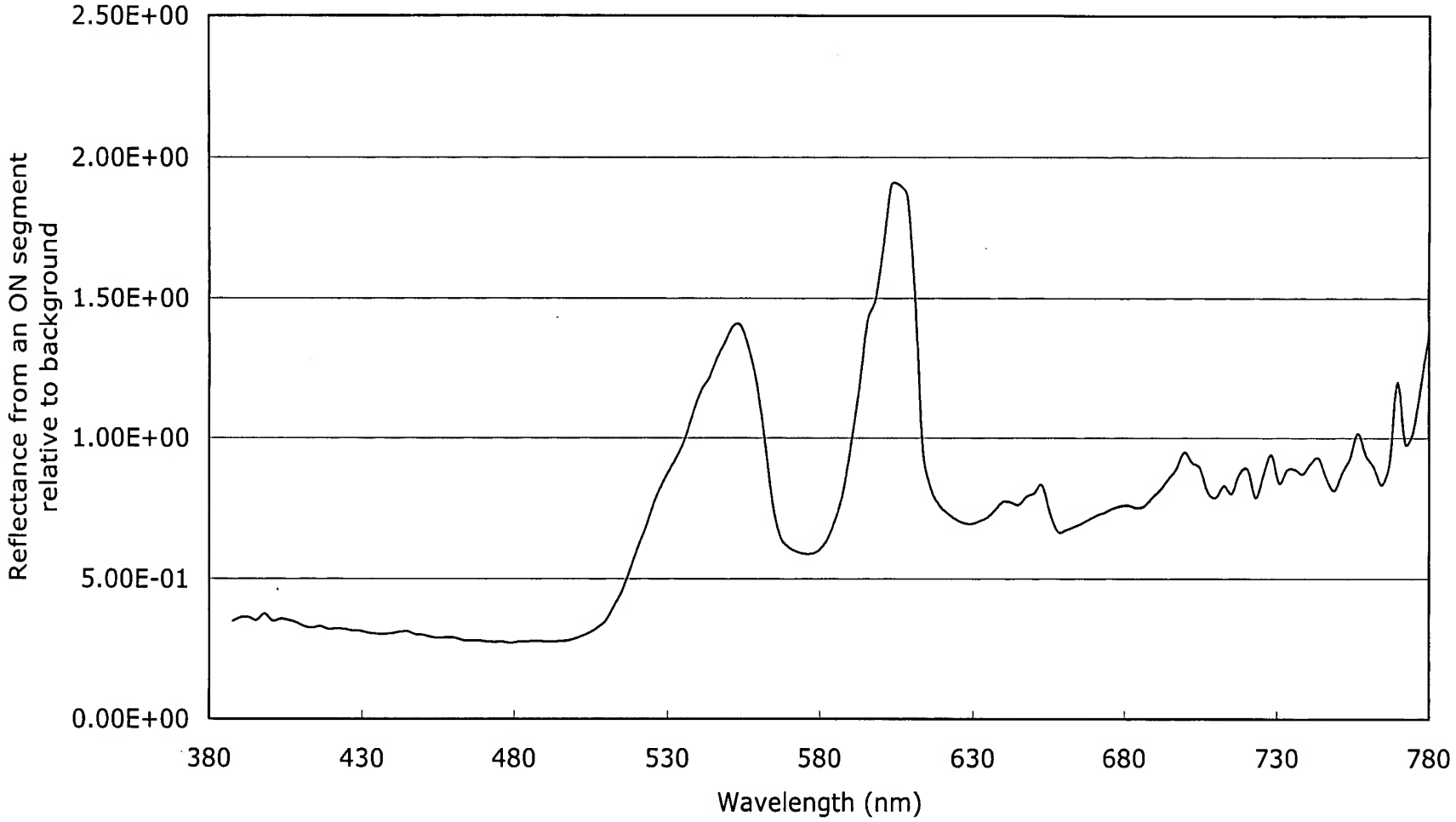
(Figure 2) Data from the unit with a Red Fluorescent layer



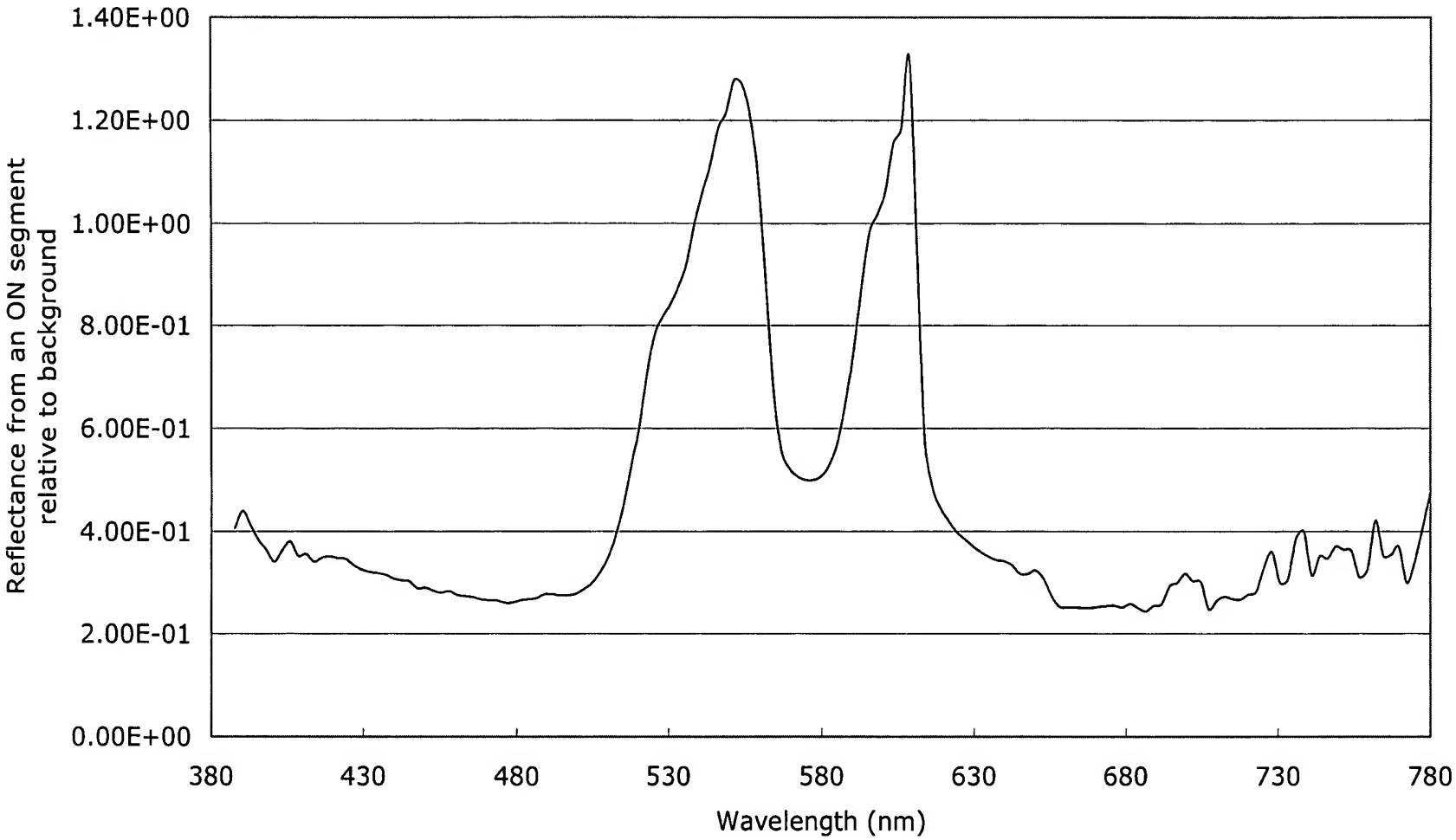
(Figure 3) Data from the unit with a Orange Fluorescent layer



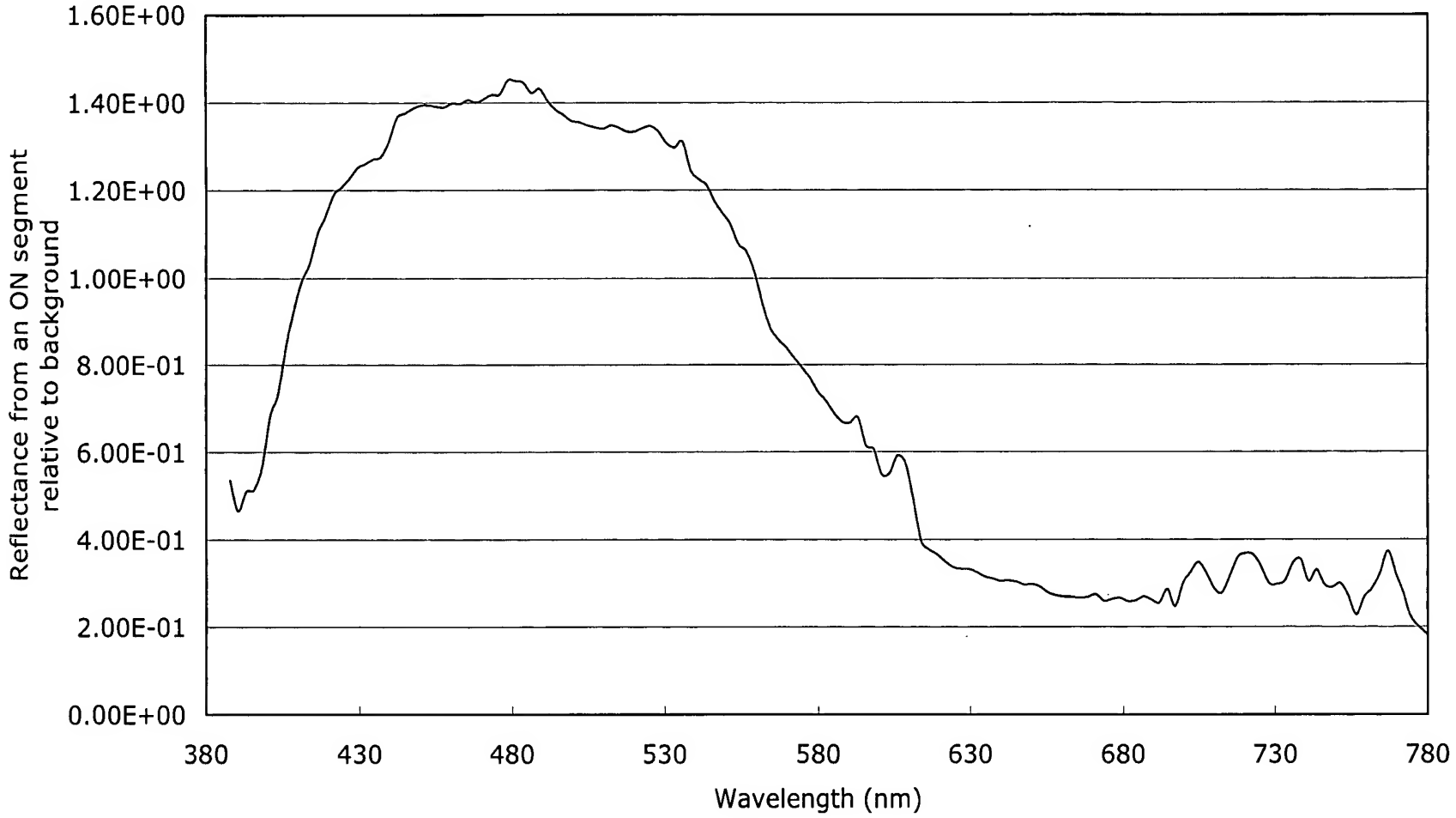
(Figure 4) Data from the unit with a Yellow Fluorescent layer



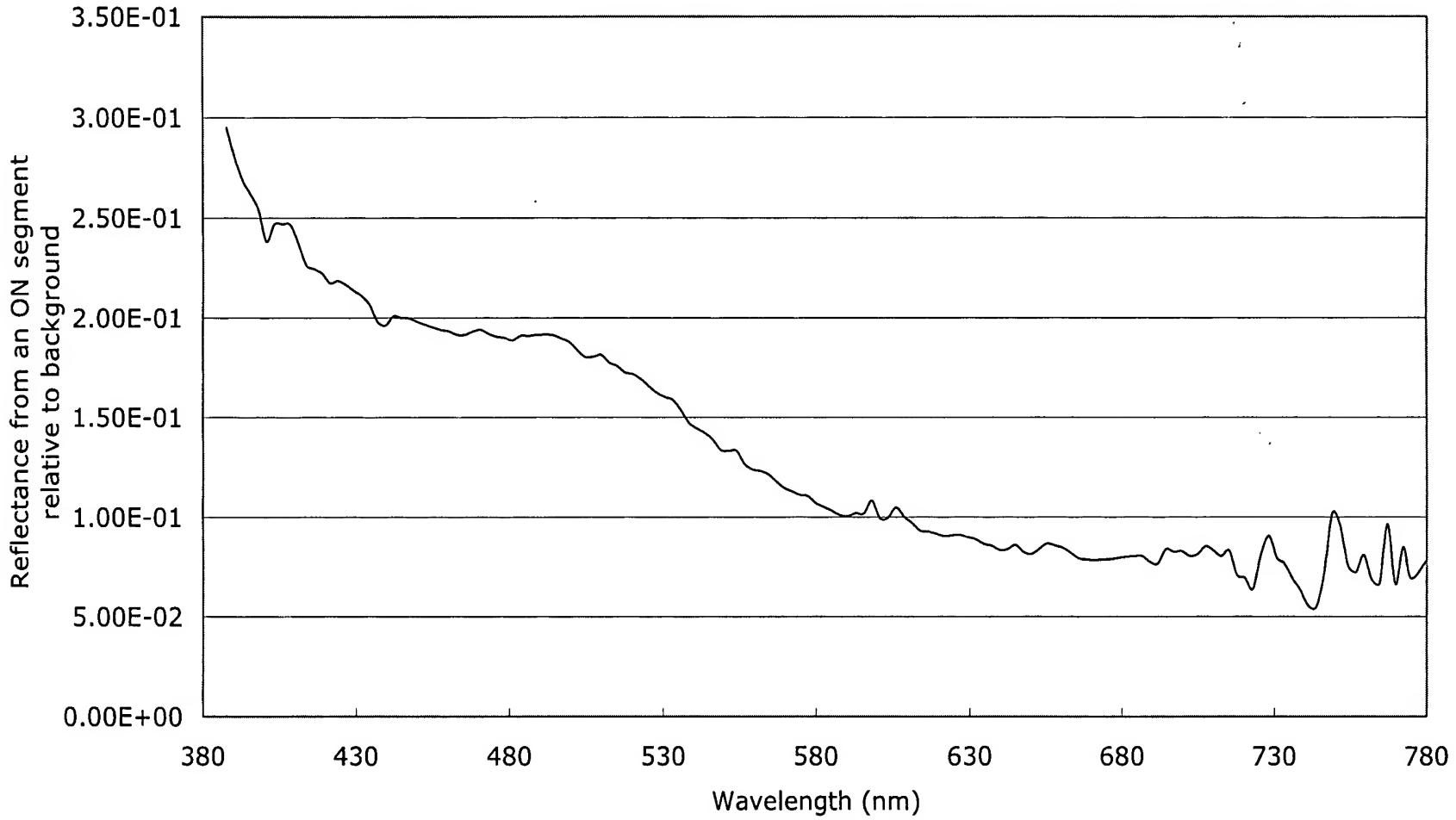
(Figure 5) Data from the unit with a Green Fluorescent layer



(Figure 6) Data from the unit with a Blue Fluorescent layer



(Figure 7) Data from the normal black/white LCD unit (Reference Unit)



PATENT

Attorney Docket No. A-76718/DNM
Application No. 10/686,363

Respectfully submitted,

Date: 21 March 2005

By:
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